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INTELLIGENT ACCIDENT ALARM SYSTEM FOR VEHICLES NEAR THE ACCIDENT POINT

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Abstract

In current years, as for increment production of automobiles, we saw technology developments and smart systems in different parts of cars. One of the most important fields which has priority about car design is safety of aboard. As for the consensus, annually, more than 1,200,000 people lost their body in road accidents. In addition to it, in some cases, because of bad weather situations or special situation of the lane, which limit the view of the driver, we see chain accidents of cars, which cause severe deaths and injuries and property lost, and blocking the road in turn, cause another problem like delay in affairs pertinent to saving and rescue. In this paper, a method to make the car more intelligent in order to overcome the problem has been discussed. The main part of the system consists of intelligent equipment of transmitter and receiver in order to send accident news and its details to the 1km radius for the cars in the neighborhood. Similarly, these systems take advantage of Global Positioning System (GPS) to determine the exact location of the accident and Global System for Mobile communication (GSM) in order to send news and accident location to the nearest emergency centre..

***Keywords**:* Accident, Car, GPS, GSM, Intelligent Alarm System

1. INTRODUCTION

Based on the definition, an accident, motor vehicle collision, motor vehicle accident, car accident, road traffic collision (RTC) or car crash, occurs when a vehicle collides with another vehicle, pedestrian, animal, road debris, or other stationary obstruction, such as a tree or utility pole. These road accidents may result in injury, death and property damage. Mortality and morbidity from road accidents assume greater importance as a country becomes

more highly developed, partly because of the increase in the numbers of accidents. The tragedy of road traffic accidents, particularly involves the young people who are adventurous. Road accidents in large numbers, which in turn cause the chain accident of vehicles, are important in populated countries [11].

Road accidents have many reasons and in majority, these accidents result in deaths and injuries and financial damages. This tragedy converted to a big problem, especially in populated developing countries.[3][4].

Because of shortage of emergency systems in cars, many humans did not receive help in time and as a result, deaths and injuries increased significantly. Road traffic accidents are the major forgotten public health problem for lots of countries yet. An estimated 1.2 million people worldwide are killed as the result of road traffic injuries each year and as many as 50 million are injured, occupying 30% to 70% of orthopedic beds in developing country's hospitals [5]. Because of it, it is necessary to design a system in regard to increase bodily and financial safety of drivers and passengers. Moreover, in the event of an accident, it is so important to design system in order to prevent probable accidents of the cars which drive in that path.

Today, wireless networks and sensors are applied in vast sections like weather, military, home automation and factories and protections pertinent to health and so on. These networks are applied in cars often, but there are defects, which force us to find remedy and make this system smarter. [1][2]

Here, we designed a system in order to find the exact location of the car in the event of an accident and sending the location to emergency center and also a system in order to send accident news to all cars which are in a radius of 1km.

1.1 Determining the Accident Location

Different types of technologies can be used to find the vehicle location on the map, including Global Positioning System (GPS), GLONASS, and GSM cellular phone positioning technology. The precision and application fields of some positioning technologies are shown in Table 1[3] [6].

Based on benefits of GPS technology, it has been widely used in many aspects of life, such as in agriculture, law, sports, the automobile industry, etc. In the automobile industry, GPS is used in many forms. Elvis N. Ngah 2006 defines GPS technology for optimal routing decisions on urban highways. [9]

The Global Positioning System (GPS) includes 24 satellites, in circular orbits around Earth. By analyzing signals from at least three of these satellites, a receiver on the surface of Earth with a built-in microprocessor can display the location of the receiver (latitude, longitude, and altitude).

Consumer receivers are the approximate size of a hand-held calculator. GPS satellites are gradually revolutionizing driving, flying, hiking, exploring, rescuing, and map making.[10]

Positioning techniques	Positioning precision	Application fields
GPS technology	10-25 meters	Vehicles ships and planes all over world
GSM mobile positioning technology	400-500 meters	The monitor of long distance freight
GLONNASS technology	10-25 meters	Fewer applications
The integration of GPS and GLONNASS	10-20 meters	Vehicles ships and planes all over world

Table: 1 The precision and application fields of positioning technologies

1.2 Crash Sensor

The most important parts of the success of the Intelligent Accident Alarm System, are the crash

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sensors. These small pieces of electronics are designed to tell when the vehicle has been damaged in an accident.

Nowadays, these types of sensors are used in many fields such as the automotive industry. These sensors could be embedded in front, rear and sides of vehicles for activating the system when an accident occurs. In other words, sensors embedded in the vehicle air bag system can be used as an activation sensor in the intelligent alarm system. The success of the alarm system relies upon the crash sensors to work accurately.

2. THE NATURE OF THE PROPOSED SYSTEM

In the offered system, if a car accident happened, shortly a signal will be sent to a radius of one kilometer to all neighboring cars and have informed them of the accident, as well as a concise message containing the exact location of the accident to the nearest emergency center will be sent.

The accident will be recognized by crash sensor and will be checked by Microcontroller, then the signal which includes the accident alarm and brief message containing geographical situation, which is registered by GPS, will be sent to emergency center.

This system uses a crash sensor, GPS, radio transmitter and receiver to communicate with other cars, and GSM system to communicate to emergency center. There are sever industries which are specialized in enhancing vehicles intelligence using navigation systems for old and new vehicles [7].The crash sensor which is assembled in the car is so small and consumes little energy. The car battery feeds this sensor. All systems assembled by modules on small electronic boards, and has high speed and perfection. These systems are generally equipped with sensors distributed in all directions of the vehicle and used to collect crash severity information [8].

This system works according to the following procedure:

(1) An accident takes place between two vehicles;

(2) If the accident severity is enough to activate crash sensors such as airbag sensors in the vehicle bumpers, the system is activated;

(3) The system takes out the location of the accident using GPS, which embedded in the vehicle;

(4) Using GSM network, this position is sent to the system located in the emergency center;

(5)Using the transmitter unit a signal will be sent in the radius of 1Km to activate an alarm in the neighbored vehicles;

(6) System located in the emergency center displays the position of the accident on the map;

(7) System situated in other vehicles which are close to the accident point activates an alarm;

Figure 1 shows the general manner of performance of the proposed accident system.

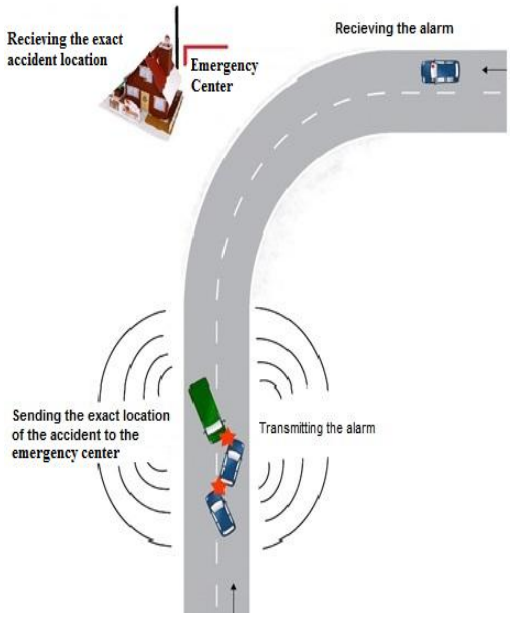

Figure: 1 General design of accident and manner of performance of the proposed accident system

3. SYSTEM IMPLEMENTATION

System has three main parts, which communicate each other and will be discussed:

1.1 Damaged car
1.2 Neighbor cars
1.3 Emergency center

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3.1 Damaged Car

As soon as the system related to the broken car has detected an accident, the proposed system will send the exact location of the accident to the emergency center, concurrently a signal will be sent to neighboring cars to inform the danger. As for our system, this section consists of crash sensor, Microcontroller, radio transmitter and receiver, alarming system, GPS, GSM. The crash sensor recognizes any powerful stroke, and the information will be given to the Microcontroller. GPS defines the crash point (latitude and longitude). And this information will be transmitted to GSM. GSM sends a message to will be sent to emergency center whom its number is saved before.

Radio transmitter sends a signal in a radius of one kilometer to all cars and informs the accident. If a car crashed in an accident, the crash sensor sends a signal to Microcontroller, then Global Positioning System provides information for latitude and longitude to emergency center and simultaneously sends a radio signal to the radius of one kilometer. Radio receiver receives accident signal and activates the alarm signal. Figure 2 shows the block diagram which is located in the vehicle

3.2 Neighbor Cars

since all cars have the same intelligent system, if a car accident took place in the neighborhood, the other cars receive an accident alarm through the radio receiver, consequently, decrease the probability of chain accidents.

3.3 Emergency System

In emergency system, GSM modem receives the accident message which contains the accurate location of the accident. The information pertinent to it will be displayed on a computer screen, and this case increases saving and rescue operation and reduces damage and loss.

In emergency center, GSM modem receives the message of the accident and sends the information to a PC and activates an alarm system. Figure 3 shows the block diagram of the emergency system.

4. RELATED CIRCUITS

4.1 Main Circuit

The circuit is shown in Figure 4.

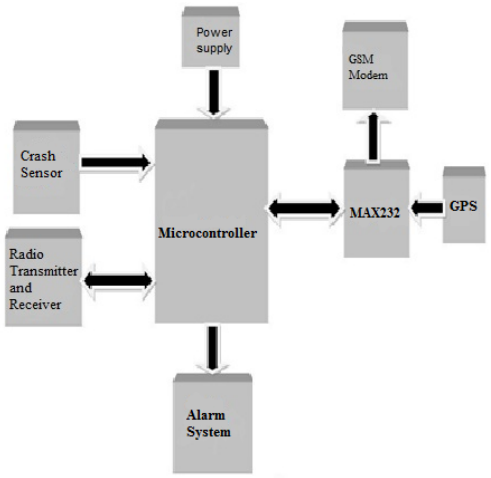

Figure: 2 Block diagram which is located in the vehicle

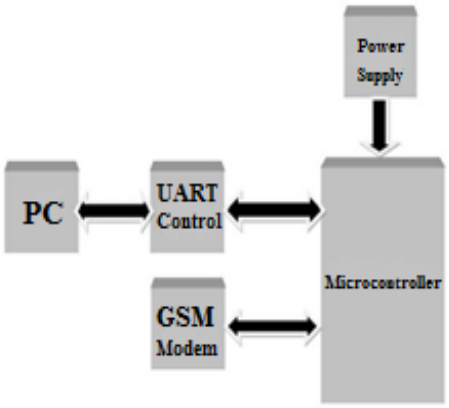

Figure: 3 Block diagram of the emergency system

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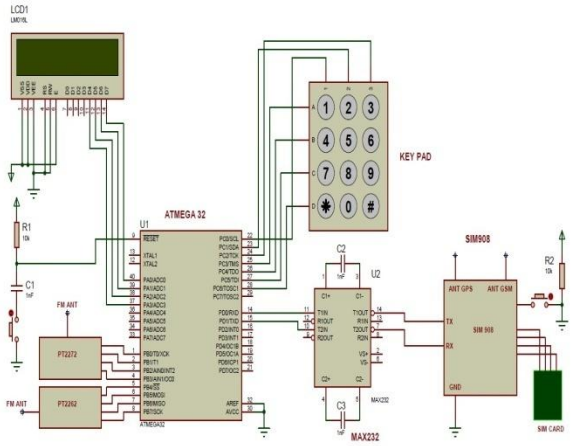

Figure: 4 Main circuit

In this circuit, AVR (ATmega32) has been used. Furthermore, module SIM 908 has been used for GPS and GSM. This circuit equips with keyboard and LCD 2*16. A key is specified for resetting all circuits.

For RF circuit, a receiver IC named PT2272-XY and a transmitter IC named PT2262 have been used. IC PT2262 is an exclusive encoder of PT2272.

4.2 Power Circuit

In Figure 5, the power circuit is displayed. In this circuit, Regulator LM2576t has been used. The output of the circuit is fixed voltage from 3 to 15 volts.

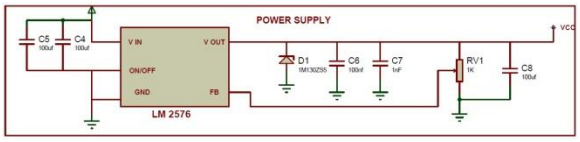

Figure: 5 Power circuit

5. CONCLUSION

In recent years, increasing the production and use of vehicles, caused a rise in road accidents and casualties. By developing technologies, different smart systems have been introduced in order to reduce road accidents and damages. In this regard, in this paper by offering a new idea, an intelligent system is introduced in order to reduce financial and bodily damages. Which its efficiency in different weather situations, lacking limitation about road situations and land complications is its important traits. As the result of applying this system in the event of an accident, minimize chain accident possibility and minimize the time of saving and rescue operation.

All parts of the system can be designed in small size, and we can locate all the module on a tiny electronic board. This system is so accurate and rapid, and if it is applied in populated countries, it will give the best results.

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